

# GPS Low Cross-polarization Antenna Array for Orbit Determination beyond Geostationary Earth Orbits

Completed Technology Project (2017 - 2018)



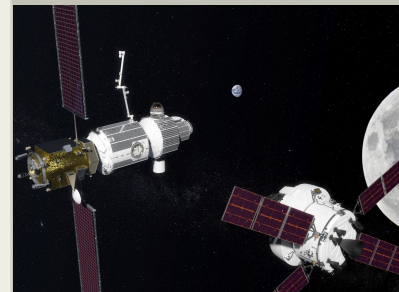
## Project Introduction

This work will expand on the recent successes of Navigator on MMS, opening new and unforeseen possibilities for the use of GPS for very high-altitude applications up to 60 RE.

This effort will focus on evaluating potential antenna array configurations that could be used to improve satellite Global Positioning System (GPS) antenna gain, scanning range and pattern control. The goal is to produce a GPS high gain antenna with low back radiation and good cross-polarization discrimination that the GSFC Navigator could control to improve the received signal and extend the potential range for GPS use for orbit determination.

## Anticipated Benefits

This work will expand on the recent successes of Navigator on MMS, opening new possibilities for the use of GPS for very high-altitude applications up to 60 RE. This high gain antenna combined with the weak signal and fast acquisition capabilities of the Navigator will enable new possibilities never thought before. Missions with highly elliptical orbits, like TESS, or manned missions like Orion could leverage from GPS signals for position determination. The Deep Space Gateway proposed by NASA, which is a cislunar space station would also benefit from having multiple options of orbit determination with the addition of GPS to RF ranging. This proposal is timely since the realization of this possibility was just attained with the MMS results. In addition, this work places GSFC in a strategic position to offer this kind of capability to future missions. This effort should be funded in order to have the complete solution (receiver and antenna) that can be offered to future missions that may benefit from using GPS at higher altitudes than its typical use.



Deep space gateway

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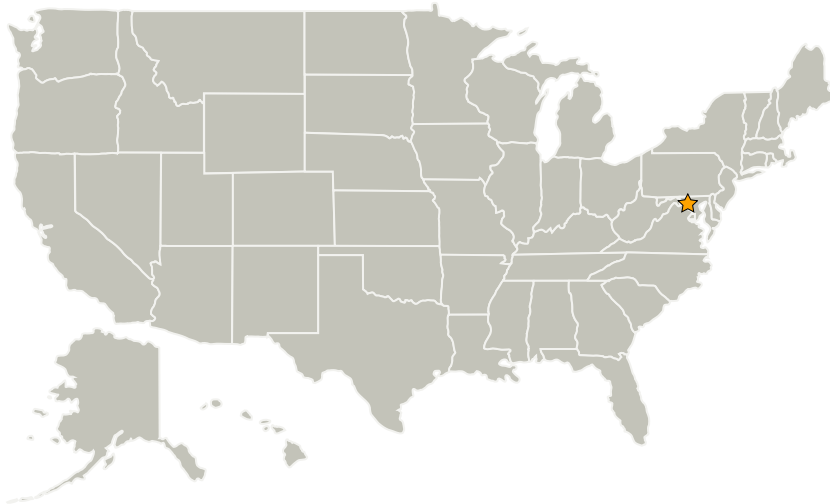
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## Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★ Goddard Space Flight Center (GSFC)	Lead Organization	NASA Center	Greenbelt, Maryland

## Images



### Deep space gateway

Deep space gateway  
(<https://techport.nasa.gov/image/28401>)

## Organizational Responsibility

### Responsible Mission Directorate:

Mission Support Directorate (MSD)

### Lead Center / Facility:

Goddard Space Flight Center (GSFC)

### Responsible Program:

Center Independent Research & Development: GSFC IRAD

## Project Management

### Program Manager:

Peter M Hughes

### Project Managers:

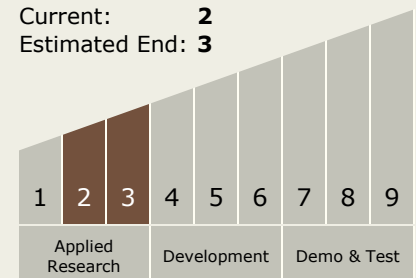
Wesley A Powell  
Timothy D Beach

### Principal Investigator:

Victor J Marrero Fontanez

## Technology Maturity (TRL)

Start: 2  
Current: 2  
Estimated End: 3



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## Technology Areas

### Primary:

- TX05 Communications, Navigation, and Orbital Debris Tracking and Characterization Systems
  - └ TX05.2 Radio Frequency
    - └ TX05.2.6 Innovative Antennas

## Target Destination

The Moon